GEOTECHNICAL ENGINEERING SERVICES
BEARING CAPACITY ASSESSMENT
PROPOSED BUILDING ADDITION
380 WARREN AVENUE
PORTLAND, MAINE

08-0785 **September 3, 2008**

Prepared for:
Biskup Construction
16 Danielle Drive
Windham, ME 04062

Prepared by:

286 Portland Road
Gray, ME 04039

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September 3, 2008

Biskup Construction
Attention: Jim Biskup
16 Danielle Drive
Windham, ME 04062

Subject: Geotechnical Engineering Services
Bearing Capacity Assessment
Proposed Building Addition
380 Warren Avenue
Portland, Maine

Dear Jim:

In accordance with our Agreement, dated August 27, 2008, we have made a subsurface investigation for the proposed building addition at 380 Warren Avenue in Portland, Maine. This report presents our findings and recommendations and is subject to the limitations presented in Attachment A.

1.0 INTRODUCTION

The purpose of our work was to obtain subsurface information at the site of the proposed building addition in order to develop geotechnical recommendations relative to foundation design and earthwork associated with the proposed building construction. The scope of work included test pit explorations, laboratory testing, a geotechnical analysis of the subsurface findings, and preparation of this report.

Based on conversations with you, we understand the proposed construction consists of an addition to the east side of the existing warehouse building at 380 Warren Avenue. The building addition will be on the order of 40 by 70 feet. We understand construction of the addition will be similar to the existing building which is steel-framed with spread footings and a slab-on-grade floor. We understand maximum column loads will be on the order of about 29 kips.

2.0 EXPLORATION AND TESTING

Two test pit explorations (TP-1 and TP-2) were made at 380 Warren Avenue on August 21, 2008. The test pits were made by Eastern Excavation, Inc. working under subcontract to others. The explorations were established in the field based on the building corners previously marked by others. The explorations were located within the proposed building footprint, approximately at the east and west center of the addition. The approximate exploration locations are shown on the "Exploration Location Plan" attached as Sheet 1. Logs of the test pits are attached as Sheet 2. A key to the notes and symbols used on the logs is attached as Sheet 3.

Laboratory testing was performed on selected samples obtained from the explorations. The results of moisture content testing are shown on the logs.

3.0 SITE AND SUBSURFACE CONDITIONS

The existing building at 380 Warren Avenue is a steel framed structure that is approximately 40 by 150 feet. The proposed addition is on the east side of the existing building. The area of the proposed addition is currently a lawn and is relatively flat.

The test pits were excavated using a Link Belt excavator to depths of about 9 to 10 feet below the existing ground surface. Below the topsoil, the test pits generally encountered about 5.5 to 6 feet of fill consisting of silty sand with some gravel and traces of brick, wood, and metal. Below the fill, test pit TP-1 encountered a layer of relic asphalt pavement underlain by relic topsoil overlying native deposits of very stiff gray to brown silty clay overlying tan to gray silty gravelly sand with a trace of clay (glacial till). Beneath the fill, test pit TP-2 encountered native gray silty sand overlying very stiff ,tan, red, and gray silty clay.

Groundwater seepage was observed in TP-1, at a depth of about 9 feet and in TP-2 at a depth of about 8.5 feet at the time of the excavation. In general, it should be anticipated that seasonal groundwater levels will fluctuate and may become perched at or near the top of the silty clay and silty gravelly sand, especially during times of snowmelt and heavy precipitation.

Please refer to the attached logs for more detailed descriptions of the subsurface findings.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 Site and Subgrade Preparation

Based on the subsurface findings, we anticipate that excavations will generally encounter fill overlying very stiff silty clay and silty gravelly sand (glacial till). We recommend that topsoil, organics, relic pavements, and fill soils be removed from beneath the proposed building addition footings.

Below the footings, fill, relic pavements, and relic topsoil should be completely removed to expose undisturbed, native soils. The lateral limits of fill, relic pavement and relic topsoil should extend at least 1 foot horizontally from the edges of footings for each foot of excavation depth. Undisturbed, native soils should be overlain with a non-woven geotextile fabric such as Mirafi 160N and backfilled with crushed stone to footing subgrade elevation.

Slab areas should be overexcavated to at least 2 feet below the finished floor elevation and proof-rolled with a smooth drum vibratory roller compactor. Any areas that become soft or continue to yield during proof-rolling should be overexcavated and backfilled with Structural Fill. The Structural Fill should meet the gradation requirements presented below.

Groundwater seepage may be encountered during excavation work, particularly during precipitation. Ditching, sumping and pumping dewatering techniques should be adequate to control groundwater within foundation excavations.

4.2 Foundation Design

Based on the subsurface findings and our understanding of the proposed construction, the proposed building at 380 Warren Avenue may be supported using spread footings provided the existing fills, relic pavement and relic topsoil are completely removed beneath footings. Footings should be underlain with at least 6 inches of compacted crushed stone placed over a non-woven geotextile fabric overlying stable native soils. The design freezing index for the Portland, Maine area is about 1,250-Fahrenheit-degree-days, which corresponds to a frost penetration depth on the order of 4.5 feet; footings exposed to freezing temperatures must have at least 4.5 feet of soil cover for frost protection. For spread footings bearing on properly prepared subgrades and backfilled with Structural Fill, we recommend the following geotechnical parameters:

- Net allowable soil bearing pressure = 2.0 ksf or less
- Base friction factor = 0.4
- Design Frost Depth = 4.5 feet

We recommend that wall footings be at least 18 inches wide and column footings at least 24 inches in their least dimension.

4.3 Foundation Drainage

We recommend that perimeter underdrains be provided adjacent to the exterior side of perimeter footings and exterior grades be sloped away from the building to reduce surface water infiltration near foundation walls. Underdrain may consist of 4 inch diameter slotted foundation drain pipe with filter sock enveloped in at least 6 inches of underdrain sand and backfilled with Structural Fill.

4.4 Backfill and Compaction

The existing fills are unsuitable for reuse as foundation backfill. We recommend foundation backfill and fill below floor slabs consist of Structural Fill as recommended herein.

Structural Fill: Foundation backfill placed adjacent to foundations and below floor slabs should be a clean, non-frost susceptible sand and gravel meeting the gradation requirements for Structural Fill as given below.

Structural Fill	
Sieve Size	**Percent Finer by Weight**
4 inch	100
3 inch	90 to 100
¼ inch	25 to 90
#40	0 to 30
#200	0 to 5

Underdrain Sand: Clean, free-draining underdrain sand used for underdrains should meet the requirements for MDOT Standard Specification 703.22 Type B "Underdrain Aggregate" as given below.

MDOT 703.22 Type B Underdrain Sand	
Sieve Size	**Percent Finer by Weight**
1 inch	95 to 100
½ inch	75 to 100
#4	50 to 100
#20	15 to 80
#50	0 to 15
#200	0 to 5
NOTE: Minimum Permeability of $1x10^{-3}$ cm/sec or faster.	

Crushed Stone: Crushed stone, used as backfill below footings should meet the requirements for MDOT Standard Specification 703.22 Type C "Underdrain Aggregate" as given below. A nominal sized uniformly graded ¾-inch washed crushed stone generally meets this gradation requirement.

MDOT 703.22 Type C Underdrain Stone	
Sieve Size	**Percent Finer by Weight**
1 inch	100
¾ inch	90 to 100
3/8 inch	0 to 75
#4	0 to 25
#10	0 to 5

Placement and Compaction: Fill should be placed in horizontal lifts and compacted such that the desired density is achieved throughout the lift thickness with 3 to 5 passes of the compaction equipment. Loose lift thicknesses for grading, fill and backfill activities should not exceed 12 inches. We recommend that fill and backfill in building areas be compacted to at least 95 percent of its maximum dry density as determined by ASTM D-1557.

4.5 Design Review and Quality Assurance Testing

S. W. COLE ENGINEERING, INC. should be retained to review the final design and specifications to determine that our earthwork recommendations have been properly interpreted and implemented.

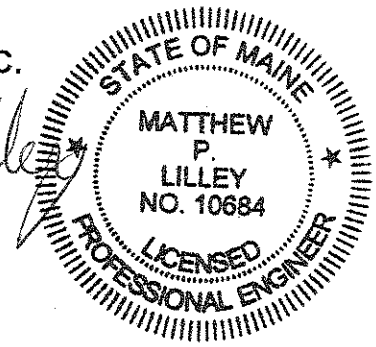
A soils and concrete testing program should also be implemented during construction to observe compliance with the design concepts, plans, and specifications. S. W. COLE ENGINEERING, INC. is available to provide field and laboratory testing services for soil, concrete, and asphalt construction materials.

5.0 CLOSURE

It has been a pleasure to be of assistance to you with this phase of your project. We look forward to working with you as the design progresses and during the construction phase of this project.

Very truly yours,

S. W. COLE ENGINEERING, INC.



Matthew P. Lilley, P. E.
Geotechnical Engineer

MPL:mpl/jlw

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Attachment A - Limitations

This report has been prepared for the exclusive use of Biskup Construction for specific application to the proposed building addition at 380 Warren Avenue in Portland, Maine. The scope of services provided by S.W.COLE ENGINEERING, INC. was limited by Biskup Construction to an assessment of allowable soil bearing capacity. S. W. COLE ENGINEERING, INC. has endeavored to conduct the work in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

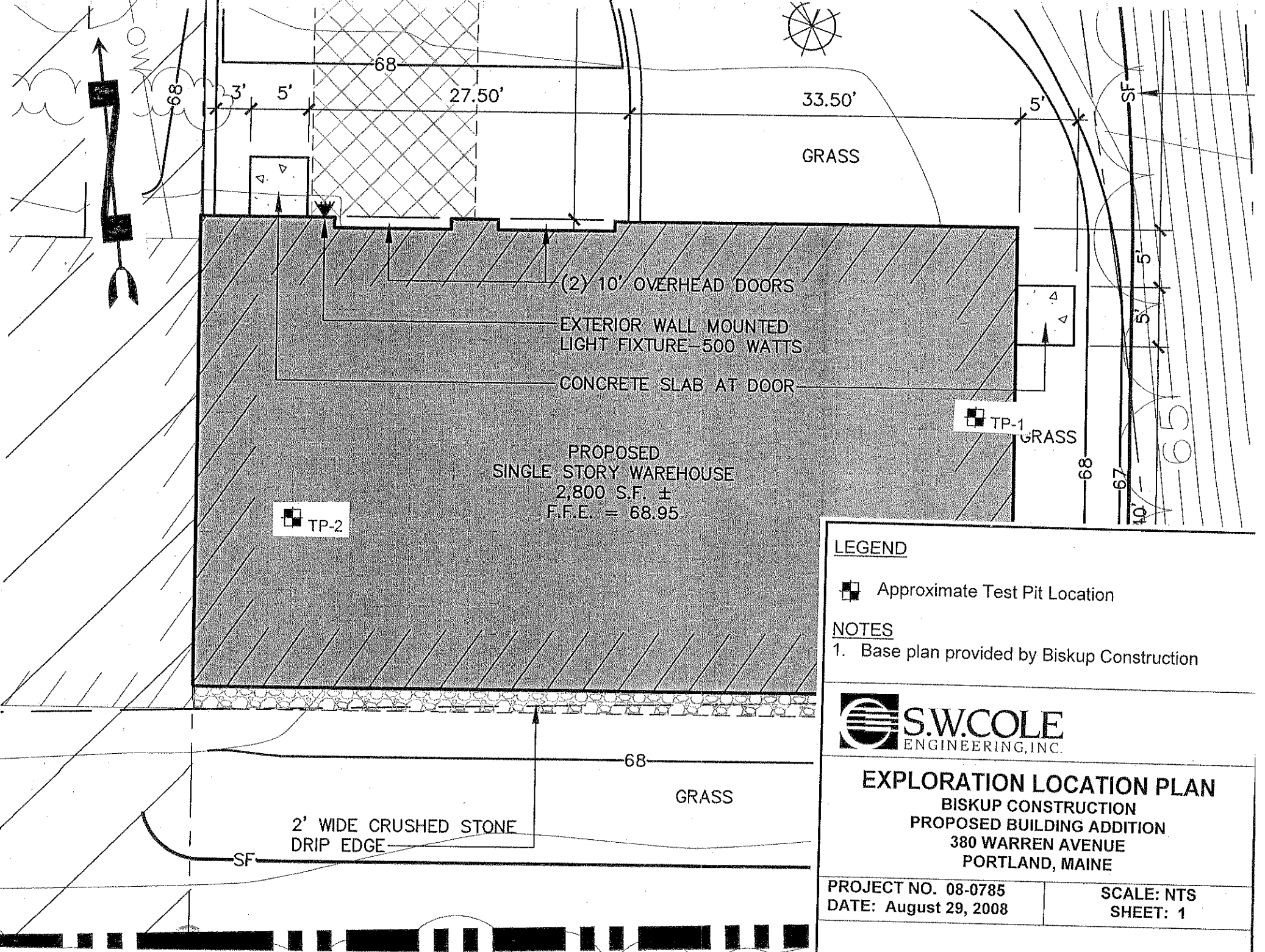
The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

The analyses performed during this investigation and recommendations presented in this report are based in part upon the data obtained from subsurface explorations made at the site. Variations in subsurface conditions may occur between explorations and may not become evident until construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and to review the recommendations of this report.

Observations have been made during exploration work to assess site groundwater levels. Fluctuations in water levels will occur due to variations in rainfall, temperature, and other factors.

S. W. COLE ENGINEERING, INC.'s scope of work has not included the investigation, detection, or prevention of any Biological Pollutants at the project site or in any existing or proposed structure at the site. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and the byproducts of any such biological organisms.

Recommendations contained in this report are based substantially upon information provided by others regarding the proposed project. In the event that any changes are made in the design, nature, or location of the proposed project, S. W. COLE ENGINEERING, INC. should review such changes as they relate to analyses associated with this report. Recommendations contained in this report shall not be considered valid unless the changes are reviewed by S. W. COLE ENGINEERING, INC.



LEGEND

Approximate Test Pit Location

NOTES

1. Base plan provided by Biskup Construction

S.W.COLE ENGINEERING, INC.

EXPLORATION LOCATION PLAN

BISKUP CONSTRUCTION
PROPOSED BUILDING ADDITION
380 WARREN AVENUE
PORTLAND, MAINE

PROJECT NO. 08-0785	SCALE: NTS
DATE: August 29, 2008	SHEET: 1

S.W.COLE ENGINEERING, INC.

TEST PIT LOGS

PROJECT/CLIENT: PROPOSED BUILDING ADDITION / BISKUP CONSTRUCTION
LOCATION: 380 WARREN AVE, PORTLAND, MAINE
PROJECT NO. 08-0785

TEST PIT TP-1

DATE: 8/21/2008 SURFACE ELEVATION: 67'± LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.3	TOPSOIL	
			BROWN SILTY SAND, SOME GRAVEL, TRACE BRICK, METAL (FILL)	
		6.0		
		6.3	RELIC ASPHALT PAVEMENT	
		7.0	RELIC TOPSOIL	
			GRAY SILTY CLAY, SOME SAND	
		8.7		
			TAN TO GRAY SILTY GRAVELLY SAND, TRACE CLAY	
		10.0	BOTTOM OF EXPLORATION @ 10.0'	

COMPLETION DEPTH: 10.0' DEPTH TO WATER: SLIGHT SEEPAGE AT 9'

TEST PIT TP-2

DATE: 8/21/2008 SURFACE ELEVATION: 68'± LOCATION: SEE SHEET 1

SAMPLE NO.	SAMPLE DEPTH	DEPTH (FT)	STRATUM DESCRIPTION	TEST RESULTS
		0.3	TOPSOIL	
			BROWN SILTY SAND, SOME GRAVEL, TRACE WOOD, BRICK, METAL (FILL)	
		5.5		
			GRAY CLAYEY SILTY SAND	
		7.2		
S1	7.5'-9.0'		w = 28.2% MOTTLED TAN, RED, GRAY SILTY CLAY ~ VERY STIFF ~	
		9.0		
			BOTTOM OF EXPLORATION @ 9.0'	

COMPLETION DEPTH: 9.0' DEPTH TO WATER: SLIGHT SEEPAGE AT 8.5'

KEY TO THE NOTES & SYMBOLS
Test Boring and Test Pit Explorations

All stratification lines represent the approximate boundary between soil types and the transition may be gradual.

Key to Symbols Used:

w	-	water content, percent (dry weight basis)
q_u	-	unconfined compressive strength, kips/sq. ft. - based on laboratory unconfined compressive test
S_v	-	field vane shear strength, kips/sq. ft.
L_v	-	lab vane shear strength, kips/sq. ft.
q_p	-	unconfined compressive strength, kips/sq. ft. based on pocket penetrometer test
O	-	organic content, percent (dry weight basis)
W_L	-	liquid limit - Atterberg test
W_P	-	plastic limit - Atterberg test
WOH	-	advance by weight of hammer
WOM	-	advance by weight of man
WOR	-	advance by weight of rods
HYD	-	advance by force of hydraulic piston on drill
RQD	-	Rock Quality Designator - an index of the quality of a rock mass. RQD is computed from recovered core samples.
γ_T	-	total soil weight
γ_B	-	buoyant soil weight
f	-	fines content (percent by weight passing U.S. No. 200 Sieve)

Description of Proportions:

0 to 5% TRACE
5 to 12% SOME
12 to 35% "Y"
35+% AND

REFUSAL: **Test Boring Explorations** - Refusal depth indicates that depth at which, in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe rod or sampler was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

REFUSAL: **Test Pit Explorations** - Refusal depth indicates that depth at which sufficient resistance to the advance of the backhoe bucket was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.